slowly altered blood does not seem to lose its virtues by having passed into a state of ice.

In the frog, the return of irritability is favoured by connexion with the general circulation. A frog was secured with its hind legs in a freezing mixture, the brain and spinal cord having been removed. In a few minutes the legs were frozen stiff, and had lost all irritability. After being frozen half an hour they were thawed. Irritability returned.

Nerves, too, like muscles, lose their excitability when frozen, and, like them, may regain it on being thawed if they have not been frozen too long. I have always found a greater difficulty in recovering nerves than muscles.

One very curious thing is this, that, as Eckard states*, when nerves are frozen, the muscles to which they are distributed are thrown into contractions; and yet when muscles themselves are frozen, there is not only no tetanic spasm, but not necessarily even the smallest quivering.

VIII. "On the alleged Sugar-forming Function of the Liver." By Frederick W. Pavy, M.D. Communicated by Dr. Sharpey, Sec. R.S. Received June 21, 1860.

(Abstract.)

This communication is an abridgement of a paper bearing the same title presented by the author to the Royal Society in 1858, with some additional matter, since disclosed by his experimental investigations.

He first shows, by analyses, that although the blood collected from the right side of the heart after death, as was formerly done, affords an abundant indication of the presence of sugar, yet that when it is removed from the same part by catheterism during life, it is found to contain but a trace of the saccharine principle. Inferences, therefore, that have been drawn of the *ante-mortem* state from *post-mortem* examinations must be abandoned as erroneous.

The heart excised instantaneously after sudden killing, contains blood as free from sugar as it is during life.

---

* Eckard, Zeitschrf. Rat. Med. vol. x. (1851).

The Royal Society is collaborating with JSTOR to digitize, preserve, and extend access to *Proceedings of the Royal Society of London.* www.jstor.org

Very slight causes are sufficient to determine the presence of a considerable amount of sugar in the circulation during life. By simply interfering with the breathing, a strongly diabetic state of the urine may be induced in an hour. To obtain a fair specimen of blood in its natural condition from the right side of the heart during life, the animal must remain in a perfectly tranquil state during the performance of catheterism.

From some recent experiments, it would appear that the blood in the right side of the heart is not appreciably more saccharine than the blood in the portal vein.

As in the case of the blood, the hitherto adopted mode of examination of the liver has, in the author's opinion, led to a fallacious inference of its physiological state. It contains a material which is exceedingly susceptible of undergoing transformation into sugar by a process of the character of fermentation. Acids, alkalies, extreme cold, and a heat sufficient to coagulate and destroy the ferment, check this transformation. And by these agencies it may be shown, that if the liver contain any sugar at the moment of death, it is only to the extent of the merest trace. The saccharine state of the liver, which has been hitherto looked upon as belonging to life, is the result of a *post-mortem* change which takes place with an astonishing rapidity.

The particular part played by the liver in reference to the point under consideration, is to form a material which was originally called the glucogenic substance. As it is not considered by the author that this material is really a sugar-forming substance under physiological conditions, he has styled it hepatine, as belonging to the liver. This substance is doubtless intended for a special and important purpose in the economy, but what this purpose precisely is, must be left for the present as an open question. As one of its properties, it is most susceptible of undergoing transformation into sugar. Although in contact with a ferment, yet it resists, under natural circumstances during life, this kind of transformation. Immediately, however, that life is destroyed, the ordinary laws of chemistry come into operation, and a change into sugar is effected. Abnormal states of the circulation, and probably of the blood, also lead to a similar production. Certain altered states of the nervous system likewise occasion an extensive formation of sugar in the system.

After division of the spinal cord just below the phrenics, the temperature falls, and the transformation of hepatine into sugar after death is so slow, that the process is easily recognized under its true light.

In the livers of animals naturally of low temperature, such as the frog, the oyster, and the mussel, it is a matter of the greatest facility to show that the organ is free from sugar during life, or at the period of death.

The ingestion of starchy and saccharine substances leads to a great accumulation of hepatine in the liver. The liver itself becomes also greatly increased in size.

The average weight of the liver in eleven dogs fed upon an animal diet was $\frac{1}{30}$th that of the animal. An analysis of seven of the livers gave an average per-centage of hepatine amounting to 7·19.

Five dogs upon a vegetable diet gave an average weight of liver equal to $\frac{1}{15}$th that of the animal. An analysis of three of the livers gave an average per-centage of hepatine amounting to 17·23.

Four dogs upon a diet of animal food with a large admixture of sugar, gave an average weight of liver equal to $\frac{1}{16\frac{1}{2}}$th of that of the animal. An analysis of the four livers gave a per-centage of hepatine precipitate amounting to 14·5.

Experiments made upon the rabbit confirm these results obtained upon the dog, showing that saccharine and amylaceous materials received as food are converted by the liver into hepatine. The author looks upon this as a strong fact in opposition to the glucogenic theory. He conceives it to be in the highest degree improbable that sugar should be transformed into hepatine by the liver for the purpose of coming back again into sugar in the same organ.

In the transformation of hepatine into sugar in the liver after death, the average of four analyses gives a loss of one part and a half of hepatine for the production of one part of sugar.

Hepatine stands in direct opposition to sugar in regard to its property of diffusibility. Its power of diffusion the author has found to be so low, that it does not pass at an ordinary pressure through animal membranes. Sugar and hepatine being mixed together and placed on one side of a piece of bladder in an endosmotic apparatus, the sugar diffuses itself and leaves the hepatine behind. This physical property of hepatine harmonizes with its retention in the hepatic cells under a natural state of the circulation.

Ligature of the portal vein causes the liver to become strongly saccharine. The blood also in the system gives a strong reaction of sugar; and in one experiment the urine yielded just a traceable indication with the copper solution. The fact that the blood thus becomes saccharine on interrupting the flow of blood through the portal vein, stands directly in opposition to the result that might have been expected under the glucogenic theory.

In a communication presented to the Royal Society in 1859, it was shown that injury to certain parts of the sympathetic system produces most rapidly a strongly diabetic state. It has since been found that the introduction of carbonate of soda largely into the circulation altogether prevents this effect.

IX. “A new Ozone-box and Test-slips.” By E. J. Lowe, Esq., F.R.A.S., F.L.S. &c. Communicated by John Lee, LL.D.

Received April 16, 1860.

The ordinary form of Ozone-box being very cumbersome, the present one has been contrived to supersede it*. The box is simple in construction, small in size, and cylindrical in form; the chamber in which the *test-slips* are hung is perfectly dark, and at the same time there is a constant current of air circulating through it, no matter from what quarter of the compass the wind is blowing. The air either passes in at the lower portion of the box and travels round a circular chamber twice, until it reaches the centre (where the test-slips are hung) and then out again at the upper portion of the box in the same circular manner, or in at the top and out again at the bottom of the box.

Fig. 1 represents a section of the upper portion of the box, showing

Fig. 1.

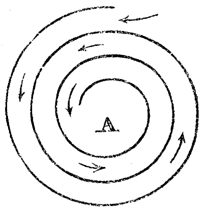
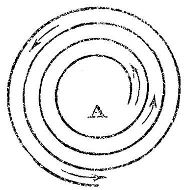


Fig. 2.



---

* A specimen of the instrument was forwarded with the paper.